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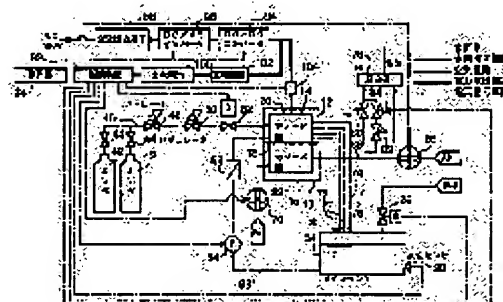
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(54) SOLID POLYMER FUEL CELL SYSTEM

(57)Abstract:

PROBLEM TO BE SOLVED: To exhaust an adequate amount of fuel gas from an anode side gas chamber of a solid polymer fuel cell main body, even in either the case of a low load and a high load.

SOLUTION: When the supply of hydrogen gas from a gas cylinder 42 to a fuel cell main body 10 starts, when a current generated in the fuel cell main body 10 is less than a threshold, a control device 92 opens an electromagnetic switch valve 84, closes a path to a high load needle valve 82 in a gas exhaust pipe 76, exhausts the non-reaction gas of an anode side gas chamber 14 only through a low load needle valve 80, and when a current generated in the fuel cell main body 10 is 20 A or higher, the control device 92 opens the electromagnetic switch valve 84, opens the high load needle valve 82 in the gas exhaust pipe 76, and exhausts the non-reaction gas in the anode side gas chamber 14 through both the low load needle valve 80 and the high load needle valve 82.



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CLAIMS

[Claim(s)]

[Claim 1] The body of a solid-state macromolecule form fuel cell with which the anode pole side air space separated with the electrode zygote and cathode pole side air space are prepared, and fuel gas is supplied to said anode pole side air space, The 1st flow control means arranged at the gas blowdown path which discharges the fuel gas which was supplied to said anode pole side air space, and was not consumed to the exterior of the body of a solid-state macromolecule form fuel cell, The 2nd flow control means which can be opened and closed and which has been arranged at said at least one or more gas blowdown paths, and was connected to juxtaposition to said 1st flow control means, A load measurement means to measure the power load to said body of a solid-state macromolecule form fuel cell, Solid-state macromolecule form fuel cell equipment characterized by having the control means which controls closing motion of said 2nd flow control means so that the discharge of the fuel gas from said gas blowdown path fluctuates according to the power load measured by said load measurement means.

[Claim 2] the flow control valve by which said 2nd flow control means was connected to juxtaposition to said 1st flow control means, and the electromagnetism connected to the serial to this flow control valve -- the solid-state macromolecule form fuel cell equipment according to claim 1 characterized by having a closing motion valve.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the solid-state macromolecule form fuel cell equipment which the fuel gas which uses hydrogen gas as a principal component is supplied, and generates power.

[0002]

[Description of the Prior Art] Since it becomes possible to generate power by supply of the fuel gas which uses hydrogen gas as a principal component, solid-state macromolecule form fuel cell equipment does not need the charge before the beginning of using as compared with a battery. The increment in need will be predicted by such advantage from now on as a power source for the outdoor type or emergencies in solid-state macromolecule form fuel cell equipment.

[0003] The configuration of the body of a solid-state macromolecule form fuel cell used for the above solid-state macromolecule form fuel cell equipments is shown in drawing 3 . The anode pole side air space 14 which uses the electrode zygote 12 as a septum, and the cathode pole side air space 16 are formed in the interior of the body 10 of a solid-state macromolecule form fuel cell (henceforth the body of a fuel cell). As shown in drawing 3 , the anode pole 20 is arranged on one field of an electrolyte 18, the cathode pole 22 is arranged on the field of another side, respectively, and the electrode zygote 12 is formed in the shape of a thin film as a whole. The anode pole 20 and the cathode pole 22 are constituted by the catalyst electrode 24 which consists of platinum etc., respectively, and the charge collector 26 by which the laminating was carried out on this catalyst electrode 24, and these anode poles 20 and the cathode pole 22 are connected to the external circuit 28. Here, as an electrolyte 18, macromolecule ion exchange membrane (for example, fluororesin system ion exchange membrane which has a sulfonic group) is used.

[0004] While the hydrogen gas of a high grade is supplied to the anode pole side air space 14 of the body 10 of a fuel cell constituted as mentioned above as fuel gas from a bomb, a refining machine (graphic display abbreviation), etc., water is supplied with a pump etc. and air is supplied to the cathode pole side air space 16 by the fan etc. The hydrogen supplied to the anode pole side air space 14 is ionized on the anode pole 20, and this hydrogen ion sets the inside of an electrolyte 18 to H^+ and xH_2O with a water molecule, and moves to the cathode pole 22 side. The hydrogen ion which moved to this cathode pole 22 side reacts with the electron which has flowed the oxygen and the external circuit 24 in air on the cathode pole 22, and generates water. Since an electron flows an external circuit 28 with the generation reaction of this water, it becomes possible to use this electron flow as electrical energy of a direct current.

[0005] According to the power consumption of an external circuit 28, the hydrogen gas supplied to the anode pole side air space 14 of the body 10 of a fuel cell as described above serves as a hydrogen ion, and is consumed. However, impure gas, such as nitrogen and carbon dioxide gas, is mixed in the hydrogen gas of industrial use, or the hydrogen gas generated from the liquefied petroleum gas etc. with the refining vessel. Within the anode pole side air space 14, since only hydrogen gas is consumed, while consumption of hydrogen gas increases, impure gas condenses. If the concentration of the impure gas which remains in the anode pole side air space 14 becomes high, ionization of the hydrogen gas in the anode pole 20 will be controlled, and the maximum output of the body 10 of a fuel cell will decline.

[0006] In order to prevent that the concentration of the impure gas in the anode pole side air space 14 becomes high, at the time of equipment actuation, there is a thing of the structure which discharges a small amount of hydrogen gas which always contained impure gas from the anode pole side air space 14 to the exterior of the

body 10 of a fuel cell in conventional solid-state macromolecule form fuel cell equipment. With such solid-state macromolecule form fuel cell equipment, flow control valves, such as a needle valve, are connected to the anode pole side air space 14, and a small amount of hydrogen gas is discharged from the anode pole side air space 14 to the exterior of the body 10 of a fuel cell through this flow control valve.

[0007]

[Problem(s) to be Solved by the Invention] However, with the above solid-state macromolecule form fuel cell equipments, while the power consumption of an external circuit increases, consumption of the hydrogen gas by the body of a fuel cell increases. For this reason, at the time of a heavy load, since concentration of impure gas is promoted while the load to the body of a fuel cell increases, if a lot of hydrogen gas is not discharged from anode pole side air space as compared with the time of a low load, the engine performance of the body of a fuel cell is unmaintainable. So, with conventional solid-state macromolecule form fuel cell equipment, whenever [valve-opening / of a flow control valve] is set up so that the hydrogen gas of a discharge which is needed at the time of a heavy load may be discharged. Consequently, with conventional solid-state macromolecule form fuel cell equipment, hydrogen gas with the concentration of impure gas lower than the time of a heavy load will be discharged from anode pole side air space outside at the time of a low load, and the ratio (power conversion effectiveness) from which the hydrogen gas supplied to anode pole side air space is changed into power falls.

[0008] The object of this invention is to discharge a proper quantity of fuel gas and offer solid-state macromolecule form fuel cell equipment with high power conversion effectiveness also in all loads in consideration of the above-mentioned data, from the anode pole side air space of the body of a solid-state macromolecule form fuel cell, in any [at the time of a low load and a heavy load] case.

[0009]

[Means for Solving the Problem] Solid-state macromolecule form fuel cell equipment according to claim 1 The body of a solid-state macromolecule form fuel cell with which the anode pole side air space separated with the electrode zygote and cathode pole side air space are prepared, and fuel gas is supplied to said anode pole side air space, The 1st flow control means arranged at the gas blowdown path which discharges the fuel gas which was supplied to said anode pole side air space, and was not consumed to the exterior of the body of a solid-state macromolecule form fuel cell, The 2nd flow control means which can be opened and closed and which has been arranged at said at least one or more gas blowdown paths, and was connected to juxtaposition to said 1st flow control means, It has a load measurement means to measure the power load to said body of a solid-state macromolecule form fuel cell, and the control means which controls closing motion of said 2nd flow control means so that the discharge of the fuel gas from said gas blowdown path fluctuates according to the power load measured by said load measurement means.

[0010] According to the solid-state macromolecule form fuel cell equipment of the above-mentioned configuration, at the time of a low load with little consumption of the fuel gas by the body of a solid-state macromolecule form fuel cell, little fuel gas is made to discharge from anode pole side air space with the 1st flow control means, and while the power load to the body of a solid-state macromolecule form fuel cell becomes high and the consumption of fuel gas increases, the discharge of the fuel gas from anode pole side air space can be increased with the 2nd flow control means. Since the fuel gas which contained a proper quantity of high-concentration impure gas from anode pole side air space can be discharged by this even when the power load to the body of a solid-state macromolecule form fuel cell is low, and even when high, it can prevent that can prevent that the concentration of the impure gas in anode pole side air space becomes high, and the output of the body of a fuel cell declines, and the utilization ratio of fuel gas falls at the time of a low load.

[0011] Even if it makes the number of the 2nd flow control means made open here according to the change in the power load to the body of a solid-state macromolecule form fuel cell when two or more 2nd flow control means are arranged at the gas blowdown path fluctuate, you may make it change the 2nd flow control means made open to that from which setting out of a blowdown flow rate differs. Moreover, you may carry out combining the control which makes the number of the 2nd flow control means made open according to the change in the power load to the body of a solid-state macromolecule form fuel cell fluctuate, and the control which changes the 2nd flow control means made open to that from which setting out of a blowdown flow rate differs.

[0012] the electromagnetism by which solid-state macromolecule form fuel cell equipment according to claim 2 was connected to the serial to the flow control valve by which said 2nd flow control means was connected to

juxtaposition to said 1st flow control means in solid-state macromolecule form fuel cell equipment according to claim 1, and this flow control valve -- it has a closing motion valve.

[0013] according to the solid-state macromolecule form fuel cell equipment of the above-mentioned configuration -- electromagnetism -- the 2nd flow control means is opened and closed and the discharge of the fuel gas from a gas blowdown path fluctuates by making a closing motion valve into which condition in an excitation condition and the condition of not exciting.

[0014]

[Embodiment of the Invention] Hereafter, the operation gestalt of this invention is explained with reference to a drawing.

[0015] (Configuration of an operation gestalt) The solid-state macromolecule form fuel cell equipment 30 applied to the operation gestalt of this invention at drawing 1 and drawing 2 is shown. In addition, since the fundamental configuration is common on the body 10 of a fuel cell explained based on drawing 3, the body of a fuel cell shown in drawing 2 attaches the same sign about a corresponding member, and omits the configuration and the detailed explanation about actuation. This solid-state macromolecule form fuel cell equipment 30 is equipped with the rectangular parallelepiped-like sheathing case 32 as shown in drawing 1. While the door 36 supported possible [a control panel 34 and closing motion] is arranged, the exhaust air section 38 is formed in one side face of this sheathing case 32 under the control panel 34. Here, the door 36 is arranged at inlet-port opening of the bomb stowage (graphic display abbreviation) established in the interior of the sheathing case 32, and the vent hole of a large number which were open for free passage to the exhaust duct (graphic display abbreviation) of the sheathing case 32 is formed in the exhaust air section 38. Moreover, the axle-pin rake 40 is stationed on the underside of the sheathing case 32 at each corner section, respectively.

[0016] In the sheathing case 32, while various kinds of members concerning power generating of body of fuel cell 10 grade shown in drawing 2 are arranged, the bomb 42 with which it filled up with high-pressure hydrogen gas is contained exchangeable. A maximum of two of this bomb 42 can be contained to the bomb stowage within the sheathing case 32, and it becomes exchangeable by opening a door 36.

[0017] As shown in drawing 2, the bomb 42 is equipped with the hand valve 44, and this hand valve 44 is connected with the anode pole side air space 14 of the body 10 of a fuel cell by the hydrogen supply pipe 46. the hydrogen supply pipe 46 -- the piping middle -- regulators 48 and 50 and electromagnetism -- the closing motion valve 52 is arranged, the 1st step of regulator 48 decompresses the high-pressure (1 - 150 Kg/mU) hydrogen gas supplied from the bomb 42 to 1 - 2 Kg/mU extent, and the 2nd step of regulator 50 decompresses the hydrogen gas decompressed by the regulator 48 to 0.05 Kg/mU extent. electromagnetism -- the closing motion valve 52 will be in an open condition at the time of impression of driver voltage (at the time of ON), and will be in a closed state at the time (at the time of OFF) of un-impressing [of driver voltage]. therefore, electromagnetism -- at the time of impression of the driver voltage to the closing motion valve 52, the hydrogen gas decompressed by regulators 48 and 50 supplies the anode pole side air space 14 -- having -- electromagnetism -- at the time of un-impressing [of the driver voltage to the closing motion valve 52], supply of the hydrogen gas to the anode pole side air space 14 is intercepted.

[0018] the electromagnetism for supplementing the Maine tank 54 and this Maine tank 54 for supplying water to the anode pole side air space 14 in the sheathing case 32 with pure water -- the closing motion valve 60 is arranged. electromagnetism -- when the closing motion valve 60 serves as open, water is supplied to the Maine tank 54 from water treatment equipment or a subtank (graphic display abbreviation). Moreover, if the Maine tank 54 is connected with the anode pole side air space 14 by the feed pipe 68 by which the pump 64 and the filter 66 have been arranged and a pump 64 drives, the water filtered with the filter 66 will be supplied to the anode pole side air space 14 from the Maine tank 54. On the other hand, air is supplied to the cathode pole side air space 16 by the fan (sirocco fan) 70.

[0019] By supplying the air containing the oxygen which is reactant gas while supplying hydrogen gas and water to the anode pole side air space 14 to the cathode pole side air space 16, it generates the electrical energy of a direct current while the body 10 of a fuel cell ionizes the hydrogen of the amount according to a power load on the anode pole 20, makes this hydrogen ion react with the electron which has flowed the oxygen and the external circuit in air on the cathode pole 22 and generates water.

[0020] In the body 10 of a fuel cell, the drainage ditch (graphic display abbreviation) is prepared under the anode pole side air space 14, and this drainage ditch and the Maine tank 54 are connected by four drain pipes

72. In order that the water supplied to the anode pole side air space 14 from the Maine tank 54 may maintain at a water retention condition the electrolyte 18 with which a part consists of macromolecule ion exchange membrane, while being used, it moves to the cathode pole 22 as H^+ and xH_2O , and the remaining water is collected to a drainage ditch. The water collected to the drainage ditch within this body 10 of a fuel cell is collected through four drain pipes 72 to the Maine tank 54.

[0021] The gas exhaust pipe 74 is connected to near [in the gas flow direction of the hydrogen gas supplied from the bomb 42] a bottom style location, and this gas exhaust pipe 74 has connected the anode pole side air space 14 with the anode pole side air space 14 to the Maine tank 54. Furthermore, the gas exhaust pipe 76 is connected to the Maine tank 54, and the gas exhaust pipe 76 has connected the Maine tank 54 with the mixer 78 for diluting hydrogen gas. the electromagnetism connected to the gas exhaust pipe 76 at the serial to the needle valve 80 for low loads, the needle valve 82 for heavy loads connected to juxtaposition to this needle valve 80 for low loads, and this needle valve 82 for heavy loads -- the closing motion valve 84 is arranged.

[0022] It flows into the gaseous layer on circulating water which the hydrogen gas and impure gas (these are hereafter called unconverted gas) which did not react on the anode pole 20 were able to collect in the Maine tank 54 through the gas exhaust pipe 74 from the anode pole side air space 14. In the gaseous layer in the Maine tank 54, moisture is removed from the unconverted gas which flowed from the anode pole side air space 14, and this unconverted gas flows into a mixer 78 through the gas exhaust pipe 76. this time -- the electromagnetism of the gas exhaust pipe 76 -- when the closing motion valve 84 is OFF, the passage to the needle valve 82 for heavy loads serves as close, and the unreacted gas in the Maine tank 54 flows into a mixer 78 only through the normally open needle valve 80 for low loads. moreover, the electromagnetism of the gas exhaust pipe 76 -- when the closing motion valve 84 is ON, the unreacted gas in the Maine tank 54 flows into a mixer 78 through the both sides of the needle valve 80 for low loads, and the needle valve 82 for heavy loads.

[0023] Here, whenever [corresponding to the time of a low load with the power load lower than a predetermined threshold to the body 10 of a fuel cell / valve-opening] is set to the needle valve 80 for low loads, and the unconverted gas of the amount which becomes proper by this needle valve 80 for low loads at the time of a low load is discharged from the anode pole side air space 14. Moreover, whenever [corresponding to the time of a heavy load with the power load more expensive than a predetermined threshold to the body 10 of a fuel cell / valve-opening] is set to the needle valve 82 for heavy loads, and the unconverted gas of the amount which becomes proper at the time of the heavy load of the body 10 of a fuel cell with the both sides of the needle valve 80 for low loads and the needle valve 82 for heavy loads is discharged from the anode pole side air space 14.

[0024] On the other hand, the cathode pole side air space 16 is also connected with a mixer 78 by the air exhaust pipe 86, and the fan (sirocco fan) 88 is connected in the middle of piping of this air exhaust pipe 86. Therefore, the unconverted gas from the anode pole side air space 14, and the cathode pole side air space 16 and the air from a fan 88 flow into a mixer 78. In order that a mixer 78 may mix the unconverted gas and air containing hydrogen gas and may prevent hydrogen explosion, it dilutes a unconverted gas with air and emits it to an exhaust duct so that hydrogen concentration may become below 0.01 volume %. The exhaust gas emitted to this exhaust duct is discharged from the exhaust air section 38 of the sheathing case 32 in the equipment exterior.

[0025] Moreover, while hydrogen gas is consumed with the body 10 of a fuel cell, the water which moved to the cathode pole side air space 16 from the anode pole side air space 14 is discharged with air to a mixer 78, and since moisture remains slightly also in the unconverted gas which flowed into the mixer 78 from the Maine tank 54 further, circulating water in the Maine tank 54 decreases in number with the increment in the operating time of solid-state macromolecule form fuel cell equipment 30. the Maine tank 54 -- water level -- a sensor 90 arranges -- having -- **** -- this water level -- if a sensor 90 falls to water level predetermined in circulating water in the Maine tank 54 -- water level -- a detecting signal is outputted to a control unit 92.

[0026] water level -- the water level from a sensor 90 -- a detecting signal -- the carrier beam control unit 92 -- electromagnetism -- the closing motion valve 60 -- open -- carrying out -- water -- the Maine tank 54 -- supplying -- after progress of predetermined time -- electromagnetism -- the closing motion valve 60 is made close. Under the present circumstances, only the time amount to which the control unit 92 was set so that a gaseous layer might surely remain on circulating water in the Maine tank 54 makes a solenoid valve 60 open.

[0027] the control unit 92 which controls the whole equipment -- the seizing signal from a control panel 34 --

winning popularity -- the electromagnetism of the hydrogen supply pipe 46 -- make the closing motion valve 52 open, start supply of hydrogen gas to the body 10 of a fuel cell, it is made to synchronize with supply initiation of this hydrogen gas, and a pump 64, a fan 70, and a fan 88 are driven. moreover, the control unit 92 -- the stop signal from a control panel 34 -- winning popularity -- the electromagnetism of the hydrogen supply pipe 46 -- the closing motion valve 52 is made close, supply of the hydrogen gas to the body 10 of a fuel cell is suspended, it is made to synchronize with the supply interruption of this hydrogen gas, and a pump 64, a fan 70, and a fan 88 are stopped.

[0028] On the other hand, after the direct current power which the body 10 of a fuel cell generated is changed into an electrical potential difference predetermined with DC to DC converter 94, it is changed into an alternating current from a direct current with the DC/AC inverter 96, and is sent to the alternating current output terminal 98. And the body 10 of a fuel cell generates the alternating current according to the power consumption of the external device (graphic display abbreviation) connected to the alternating current output terminal 98. Moreover, the solid-state macromolecule form fuel cell equipment 30 of this operation gestalt is constituted as a self-conclusion type which is unnecessary in the electric power supply from the outside. For this reason, it has the charge circuit 102 for charging the rechargeable battery 100 which is the power source used at the time of starting, and this rechargeable battery 100. This charge circuit 102 charges a rechargeable battery 100 with the dump power of the body 10 of a fuel cell.

[0029] Moreover, the current sensor 104 for measuring the load to the body 10 of a fuel cell is arranged at wiring which connected the body 10 of a fuel cell to DC to DC converter 94 and the charge circuit 102. This current sensor 104 outputs the current detecting signal corresponding to the current of the direct current power which the body 10 of a fuel cell generated to a control unit 92.

[0030] (Operation of this operation gestalt) The control routine of the control device 92 of the solid-state giant-molecule form fuel cell equipment 30 of this operation gestalt constituted as mentioned above is hereafter explained with reference to drawing 4. If supply of hydrogen gas is started from a bomb 42 to the body 10 of a fuel cell in response to the seizing signal from a control panel 34 at step 202 of drawing 4, more than a threshold (it is 20A when rating is 1kw) predetermined in the generating current of the body 10 of a fuel cell, and under a threshold will be judged by the current detecting signal from a current sensor 104 at step 204. the above step 202,204 -- the electromagnetism of the gas exhaust pipe 76 -- the closing motion valve 84 has close.

[0031] the case where the generating current of the body 10 of a fuel cell carried out at step 204, and it is judged more than as a threshold -- step 206 -- the electromagnetism of the gas exhaust pipe 76 -- the case where made the closing motion valve 84 open, and the generating current of the body 10 of a fuel cell is judged to be under a threshold at step 204 -- step 208 -- the electromagnetism of the gas exhaust pipe 76 -- the closing motion valve 84 is made open.

[0032] After controlling the needle valve 82 for heavy loads by step 206,208, it judges whether the stop signal inputted from the control panel 34. When it is judged that terminate a control routine when what the stop signal inputted at this step 210 is judged, and the stop signal has not inputted, it returns to step 204 and the routine of steps 204-210 is repeated.

[0033] As described above, with the solid-state macromolecule form fuel cell equipment 30 of this operation gestalt When the generating current of the body 10 of a fuel cell is under a threshold, a control unit 92 the power load to the body 10 of a fuel cell is low -- judging -- the electromagnetism of the gas exhaust pipe 76 -- make the closing motion valve 84 close, and when the generating current of the body 10 of a fuel cell is more than a threshold, the power load to the body 10 of a fuel cell is expensive -- judging -- the electromagnetism of the gas exhaust pipe 76 -- the closing motion valve 84 is made open. Therefore, when the power load of the body 10 of a fuel cell is low, a unconverted gas flows into a mixer 78 from the anode pole side air space 14 only through the needle valve 80 for low loads. On the other hand, when the power load of the body 10 of a fuel cell is expensive, a unconverted gas flows into a mixer 78 from the anode pole side air space 14 through the both sides of the needle valve 80 for low loads, and the needle valve 82 for heavy loads, and the discharge of the unconverted gas from the anode pole side air space 14 increases as compared with the time of a low load. Since the hydrogen gas which contained a proper quantity of high-concentration impure gas from the anode pole side air space 14 can be discharged by this even when the power load to the body 10 of a fuel cell is low, and even when high, it can prevent that can prevent that the concentration of the impure gas in hydrogen gas becomes high, and the output of the body 10 of a fuel cell declines into the anode pole side air space 14, and the

utilization ratio of hydrogen gas falls at the time of a low power load.

[0034] moreover, the electromagnetism which opens and closes the needle valve connected to the gas exhaust pipe 76 to the needle valve 80 for low loads at juxtaposition, and this needle valve -- it is also possible to arrange two or more closing motion valves every. for example, the gas exhaust pipe 76 -- a needle valve and electromagnetism, when it has arranged two closing motion valves at a time When the power load of the body 10 of a fuel cell becomes the 1st threshold, while the gas discharge was set as the amount of middle classes, passage to the needle valve for loads is made open. Passage to the needle valve for heavy loads by which the gas discharge was set as the large flow rate while making close passage to the needle valve for inside loads, when a power load became the 2nd larger threshold than the 1st threshold is made open. When a power load becomes the 3rd larger threshold than the 2nd threshold, it becomes possible in two pieces to change the discharge of the unconverted gas from the anode pole side air space 14 to four steps by making open simultaneously passage to the needle valve for heavy loads.

[0035]

[Effect of the Invention] As explained above, even when the power load to the body of a solid-state macromolecule form fuel cell is low, and even when high, according to the solid-state macromolecule form fuel cell equipment of this invention, a proper quantity of fuel gas can be discharged from anode pole side air space.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the perspective view showing the appearance of the solid-state macromolecule form fuel cell equipment concerning the operation gestalt of this invention.

[Drawing 2] It is the block diagram showing the configuration of the solid-state giant-molecule form fuel cell equipment concerning the operation gestalt of this invention.

[Drawing 3] It is the sectional view showing the configuration of the body of a fuel cell in the solid-state macromolecule form fuel cell equipment concerning the operation gestalt of this invention.

[Drawing 4] It is the flow chart which shows the control routine to the needle valve for heavy loads in the solid-state giant-molecule form fuel cell equipment concerning the operation gestalt of this invention.

[Description of Notations]

10 Body of Fuel Cell (Body of Solid-state Macromolecule Form Fuel Cell)

12 Electrode Zygote

14 Anode Pole Side Air Space

16 Cathode Pole Side Air Space

18 Electrolyte

20 Anode Pole

22 Cathode Pole

30 Solid-state Macromolecule Form Fuel Cell Equipment

54 Main Tank (Gas Blowdown Path)

70 Fan

74 Gas Exhaust Pipe (Gas Blowdown Path)

76 Gas Exhaust Pipe (Gas Blowdown Path)

78 Mixer

80 Needle Valve for Low Loads (1st Flow Control Means)

82 Needle Valve for Heavy Loads (Flow Control Valve)

84 Electromagnetism -- Closing Motion Valve

86 Air Exhaust Pipe

88 Fan

92 Control Unit

104 Current Sensor (Load Measurement Means)

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